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जड़ित परिशुद्धता प्रतिरोधक
मूल्यांकन स्तर ई

Indian Standard

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT

Blank Detail Specification :
Fixed Precision Resistors
Assessment Level E

UDC 621·316·8

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Indian Standard

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT

Blank Detail Specification : Fixed Precision Resistors Assessment Level E

NATIONAL FOREWORD

This Indian Standard, which is identical with IEC Pub 115-5-1/QC 400301 (1983) 'Fixed resistors for use in electronic equipment — Part 5 : Blank detail specification : Fixed precision resistors — Assessment level E', issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on the recommendations of the Resistors Sectional Committee (LTD 14) and approval of the Electronics and Telecommunication Division Council.

The text of the IEC standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

> Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC Pub 115-1	IS QC 400000 : 1988 Fixed resistors for use in electronic equipment : Generic specification	Identical
IEC Pub 115-5	IS QC 400300 : 1992 Fixed resistors for use in electronic equipment : Sectional specification : Fixed precision resistors	Identical

The concerned technical committee has reviewed the provisions of IEC Pub 63 and IEC Pub 410 referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard.

This standard is intended primarily for use under the IECQ System. A regular Indian Standard for this component could be different, identical or similar to this standard.

Only the English language text in the International Standard has been retained while adopting it as Indian Standard.

As in the Original Standard, this Page is Intentionally Left Blank

INTRODUCTION

Blank detail specification

A blank detail specification is a supplementary document to the Sectional Specification and contains requirements for style and layout and minimum content of detail specifications. Detail specifications not complying with these requirements shall not be considered as being in accordance with IEC specifications nor shall they so be described.

In the preparation of detail specifications the content of Sub-clause 1.4 of the Sectional Specification shall be taken into account.

The numbers between brackets on the first page correspond to the following information which shall be inserted in the position indicated:

Identification of the detail specification

[1] The "International Electrotechnical Commission" or the National Standards Organization under whose authority the detail specification is drafted.

[2] The IEC or National Standards number of the detail specification, date of issue and any further information required by the national system.

[3] The number and issue number of the IEC or national Generic Specification.

[4] The IEC number of the blank detail specification.

Identification of the resistor

[5] A short description of the type of resistor.

[6] Information on typical construction (when applicable).

Note. — When the resistor is not designed for use in printed board applications, this shall be clearly stated in the detail specification in this position.

[7] Outline drawing with main dimensions which are of importance for interchangeability and/or reference to the national or international documents for outlines. Alternatively, this drawing may be given in an appendix to the detail specification.

[8] Application or group of applications covered and/or assessment level.

Note. — The assessment level(s) to be used in a detail specification shall be selected from the sectional specification, Sub-clause 3.3.3. This implies that one blank detail specification may be used in combination with several assessment levels, provided the grouping of the tests does not change.

[9] Reference data on the most important properties, to allow comparison between the various resistor types.

[1]	IEC 115-5-1-XXX [2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 115-5-1 [4]
Outline drawing: (see Table I) (First angle projection) [7] (Other shapes are permitted within the dimensions given)	**FIXED PRECISION RESISTORS** [5]
	Insulated/non-insulated [6]
	Assessment level(s): E [8] Stability class: . . . %

Information on the availability of components qualified to this detail specification is given in the Qualified Products List.

[9]

SECTION ONE — GENERAL DATA

1. General data

1.1 *Recommended method(s) of mounting* (to be inserted)

(See Sub-clause 1.4.2 of IEC Publication 115-5.)

1.2 *Dimensions, ratings and characteristics*

TABLE I

Style	Rated dissipation at 70 °C (W)	Temperature coefficient α in 10^{-6}/°C	Limiting element voltage (V d.c. or a.c. r.m.s.)	Isolation voltage (V d.c. or a.c. peak)	Maximum dimensions		$d_{\text{nom.}}$: Tol.:
					L	D	

All dimensions are in millimetres or inches and millimetres.

Resistance range*	... to ...
Tolerances on rated resistance	... ± ... %
Climatic category	–/–/–
Low air pressure	8.5 kPa (85 mbar)
Stability class	...%
Limits for change of resistance:	
— for long-term tests	$\pm(\ldots\% R + \ldots \Omega)$
— for short-term tests	$\pm(\ldots\% R + \ldots \Omega)$
Temperature coefficient	α: ... 10^{-6}/°C

1.2.1 *Derating*

Resistors covered by this specification are derated according to the following curve:

(A suitable curve to be included in the detail specification)

Note. — The details of the marking of the component and package shall be given in full in the detail specification.

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[*] The preferred values are those of the E-series of IEC Publication 63: Preferred Number Series for Resistors and Capacitors.

1.3 *Related documents*

Generic Specification: IEC Publication 115-1 (1982): Fixed Resistors for Use in Electronic Equipment, Part 1: Generic Specification.

Sectional Specification: IEC Publication 115-5 (1982): Part 5: Sectional Specification: Fixed Precision Resistors.

1.4 *Marking*

The marking of the components and package shall be in accordance with the requirements of IEC Publication 115-1, Sub-clause 2.4.

Note. — The details of the marking of the component and package shall be given in full in the detail specification.

1.5 *Ordering information*

Orders for resistors covered by this specification shall contain, in clear or in coded form, the following minimum information:

a) Rated resistance.

b) Tolerance on rated resistance.

c) Number and issue number reference of the detail specification and style reference.

1.6 *Certified records of released lots*

Required/not required.

1.7 *Additional information (not for inspection purposes)*

1.8 *Additional or increased severities or requirements to those specified in the generic and/or sectional specification*

Note. — Additions or increased requirements should be specified only when essential.

SECTION TWO — INSPECTION REQUIREMENTS

2. **Inspection requirements**

2.1 *Procedures*

2.1.1 — For Qualification Approval the procedure shall be in accordance with the Sectional Specification, IEC Publication 115-5, Sub-clause 3.2.

2.1.2 — For Quality Conformance Inspection the test schedule (Table II) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by Sub-clause 3.3.1 of the Sectional Specification.

Note. — When drying is called for, Procedure I of Sub-clause 4.3 of the Generic Specification, IEC Publication 115-1, shall be used.

TABLE II

Notes 1. — Sub-clause numbers of test and performance requirements refer to the Generic Specification, IEC Publication 115-1, except for resistance change requirements, which have to be selected from the Tables I and II of the sectional specification, as appropriate.

2. — Inspection Levels and AQL's are selected from IEC Publication 410: Sampling Plans and Procedures for Inspection by Attributes.

3. — In this table:
p = periodicity (in months)
n = sample size
c = acceptance criterion (permitted number of defectives)
D = destructive
ND = non-destructive
IL = inspection level } IEC Publication 410
AQL = acceptable quality level } IEC Publication 410

<table>
<tr><th rowspan="2">Sub-clause number and Test
(see Note 1)</th><th rowspan="2">D or ND</th><th rowspan="2">Conditions of test
(see Note 1)</th><th>I L</th><th>A Q L</th><th rowspan="2">Performance requirements
(see Note 1)</th></tr>
<tr><th colspan="2">(see Note 2)</th></tr>
<tr><td>**Group A Inspection**
(lot-by-lot)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>*Sub-group A1*</td><td>ND</td><td></td><td>S-4</td><td>1.0%</td><td></td></tr>
<tr><td>4.4.1 Visual examination</td><td></td><td></td><td></td><td></td><td>As in 4.4.1
Legible marking and as specified in 1.4 of this specification</td></tr>
<tr><td>*Sub-group A2*</td><td>ND</td><td></td><td>S-4</td><td>1.0%</td><td></td></tr>
<tr><td>4.4.2 Dimensions (gauging)</td><td></td><td>A gauge-plate of . . . mm shall be used (if applicable)</td><td></td><td></td><td>As specified in Table I of this specification</td></tr>
<tr><td>4.5 Resistance</td><td></td><td></td><td></td><td></td><td>As in 4.5.2</td></tr>
<tr><td>**Group B Inspection**
(lot-by-lot)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>*Sub-group B1*</td><td>ND</td><td></td><td>S-3</td><td>1.0%</td><td></td></tr>
<tr><td>4.7 Voltage proof
(Insulated resistors only)</td><td></td><td>Method: . . .</td><td></td><td></td><td>No breakdown or flashover</td></tr>
<tr><td>*Sub-group B2*</td><td>D</td><td></td><td>S-3</td><td>2.5%</td><td></td></tr>
<tr><td>4.17 Solderability</td><td></td><td>Without ageing
Method: . . .</td><td></td><td></td><td>Good tinning as evidenced by free flowing of the solder with wetting of the terminations or solder shall flow within . . . s, as applicable</td></tr>
<tr><td>4.13 Overload</td><td></td><td><table><tr><th>Test* duration</th><th>Rated* dissipation</th></tr><tr><td></td><td></td></tr></table>The applied voltage shall be 2.5 times the rated voltage or twice the limiting element voltage, whichever is the less severe</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Visual examination</td><td></td><td></td><td>No visible damage
Legible marking</td></tr>
<tr><td></td><td></td><td>Resistance</td><td></td><td></td><td>$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$</td></tr>
</table>

* See Sub-clause 2.3.4 of the sectional specification.

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	IL (see Note 2)	AQL	Performance requirements (see Note 1)
Sub-group B3	ND		S-3	2.5%	
4.8.4.2 Temperature coefficient of resistance		This test is applicable only when a temperature coefficient of resistance of less than ±50 · 10^{-6}/°C is claimed. One cycle of 20 °C to 70 °C to 20 °C only			α:... 10^{-6}/°C

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Group C Inspection (periodic)						
Sub-group C1A	D		3	10		
Half of the sample of Sub-group C1						
4.16 Robustness of terminations		Tensile, bending and torsion tests as applicable				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
4.18 Resistance to soldering heat		Method:...				
		Visual examination				No visible damage Legible marking
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
Sub-group C1B	D		3	10		
Other half of the sample of Sub-group C1						
4.19 Rapid change of temperature		θ_A = Lower category temperature θ_B = Upper category temperature				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
4.20 Bump (or shock, see 4.21)		Method of mounting see 1.1 of this specification Acceleration: 390 m/s^2 Number of bumps: 4 000				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
4.21 Shock (or bump, see 4.20)		Method of mounting: see 1.1 of this specification Acceleration: 490 m/s^2 Duration of pulse: 11 ms Pulse shape: half-sine				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
4.22 Vibration		Method of mounting: see 1.1 of this specification Procedure: B4 Frequency range: ... Hz to ... Hz (see 2.3.2 of the sectional specification) Amplitude: 0.75 mm or acceleration 98 m/s^2 (whichever is the less severe) Total duration: 6 h				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
Sub-group C1 Combined sample of specimens of Sub-groups C1A and C1B	D		3	20	1	
4.23 Climatic sequence — Dry heat — Damp heat, cyclic, Test Db, first cycle — Cold						
— Low air pressure		8.5 kPa (85 mbar)				
— Damp heat, cyclic, Test Db, remaining cycles — D.C. load (for non-wire-wound types only)						
		Visual examination				No visible damage Legible marking
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
		Insulation resistance (Insulated resistors only)				$R \geqslant 100\ \text{M}\Omega$
Sub-group C2 4.25.1 Endurance at 70 °C	D	Duration: 1 000 h Examination at 48 h, 500 h and 1 000 h:	3	20	1	
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
		Examination at 1 000 h: Insulation resistance (Insulated resistors only)				$R \geqslant 1\ \text{G}\Omega$
		If required by the detail specification, the test shall be extended to 8 000 h Examination at 2 000 h, 4 000 h and 8 000 h: Resistance	12	20	—	$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$ (The results obtained are for information only)

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Sub-group C3	ND		3	20	1	
4.8 Variation of resistance with temperature		Lower category temperature/20 °C				$\frac{\Delta R}{R} \leqslant \pm \ldots\%$ or $\alpha: \ldots 10^{-6}/°C$
		20 °C/upper category temperature				$\frac{\Delta R}{R} \leqslant \pm \ldots\%$ or $\alpha: \ldots 10^{-6}/°C$
Group D Inspection (periodic)						
Sub-group D1	D		12	20	1	
4.24 Damp heat, steady state		1) Sub-clause 4.24.2.1 1st group 6 specimens 2nd group 7 specimens 3rd group 7 specimens 2) Sub-clause 4.24.2.2 1st group 10 specimens 2nd group 10 specimens				
		Visual examination				No visible damage Legible marking
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
		Insulation resistance (Insulated resistors only)				$R \geqslant 100$ MΩ
Sub-group D2	D		36	20	1	
4.4.3 Dimensions (detail)						As specified in Table I of this specification
4.25.3 Endurance at upper category temperature		Duration: 1 000 h Examination at 48 h, 500 h and 1 000 h:				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$
		Examination at 1 000 h: Insulation resistance (Insulated resistors only)				$R \geqslant 1$ GΩ
Sub-group D3	D		36	20	1	
4.25 Endurance at other temperatures (if applicable)		(This sub-group is only applicable if a derating curve other than that shown in the sectional specification, IEC Publication 115-5, Sub-clause 2.2.3, is claimed in the detail specification)				
		Duration: 1 000 h Examination at 48 h, 500 h and 1 000 h:				
		Visual examination				No visible damage
		Resistance				$\Delta R \leqslant \pm(\ldots\% R + \ldots \Omega)$ (As for Sub-group C2)
		Examination at 1 000 h: Insulation resistance (Insulated resistors only)				$R \geqslant 1$ GΩ

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Sub-group D4	D		36	13	1	
4.9 Reactance (if applicable)						$L/R \leqslant \ldots$ s or $L \leqslant \ldots$ mH
4.15 Robustness of the resistor body (if applicable)		See 2.3.5 of the sectional specification				No breakage or cracks